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Systematics of the genus *Scleroplax* Rathbun, 1893 (Crustacea: Brachyura: Pinnotheridae)

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Abstract

The taxonomic status of the monotypic genus *Scleroplax* Rathbun, 1893, is evaluated and separated from other genera of the *Pinnixa* White, 1846, complex. Distinguishing characters of *Scleroplax* are a hard, subheptagonal and dorsally, highly convex carapace, and a third maxilliped with a propodus that extends to the end of the dactylus. The genera *Scleroplax, Pinnixa, Austinixa* Heard & Manning, 1997, *Glassella* Campos & Wicksten, 1997, *Indopinnixa* Manning & Morton, 1987, and *Tetrias* Rathbun, 1898, share a carapace than is wider than long and a distinct lateral exopod lobe on the third maxilliped, all of which may represent monophyletic characters. Updated information on the distribution and hosts of *S. granulata* Rathbun, 1893, indicate that the species now ranges from Vancouver Island, British Columbia, Canada to El Coyote estuary, Punta Abreojos, Baja California Sur, México. It inhabits burrows of the echiuroid *Urechis caupo* Fisher & MacGinitie, 1928, and the mud shrimps *Neotrypaea californiensis* (Dana, 1854), *N. gigas* (Dana, 1852) (new host record), *Upogebia pugettensis* (Dana, 1852), and occasionally *U. macginiteorum* Williams, 1986 (new host record).

Key words: Crustacea, Brachyura, Pinnotheridae, *Scleroplax,* systematics, geographic distribution, new hosts

Resumen

El estatus taxonómico del género monotípico *Scleroplax* Rathbun, 1893, es evaluado y separado de otros géneros del complejo *Pinnixa* White, 1846. Caracteres diagnósticos de *Scleroplax* son un caparazón subpentagonal, duro, convexo y dorsalmente alto, y el tercer maxilípedo con un propodio que se extiende hasta el final del dáctilo. Los géneros *Scleroplax*, *Pinnixa, Austinixa* Heard & Manning, 1997, *Glassella* Campos & Wicksten, 1997, *Indopinnixa* Manning & Morton, 1987, y *Tetrias* Rathbun, 1898, comparten un caparazón que es mas ancho que largo y un distinguible lóbulo lateral sobre el exópodo del tercer maxilípedo, los cuales podrían representar características monofiléticas. Información actualizada sobre la distribución y huéspedes de *S. granulata* Rathbun, 1893, indica que esta especie se distribuye desde la Isla Vancouver, Columbia Británica, Canadá

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hasta el Estero El Coyote, Punta Abreojos, Baja California Sur, México. Esta habita en las madrigueras del equiúrido *Urechis caupo* Fisher & MacGinitie, 1928, y de los camarones de fango *Neotrypaea californiensis* (Dana, 1854), *N. gigas* (Dana, 1852) (nuevo huésped), *Upogebia pugettensis* (Dana, 1852) y ocasionalmente *U. macginiteorum* Williams, 1986 (nuevo huésped).

Palabras clave: Crustacea, Brachyura, Pinnotheridae, *Scleroplax*, sistemática, distribución geográfica, nuevos huéspedes

Introduction

Ongoing studies on the subfamily Pinnotherinae prompted a reassessment of the diagnosis of the genus *Scleroplax* Rathbun, 1893. This genus was erected to accommodate its type species, *S. granulata* Rathbun, 1893, which inhabits burrows of estuarine invertebrates along the west coast of Canada, United States, and northern México (Bonfil *et al.* 1992). Since its description, the systematic position of this monotypic genus has been somewhat controversial. Holmes (1900) synonymyzed it with *Pinnixa* White, 1846, while Rathbun (1893, 1918) and subsequent authors considered the genus as distinct. Rathbun supported this separation because, unlike *Pinnixa*, the anterolateral and posterolateral margins in *Scleroplax* curve gradually and do not form an angle, which should not be considered a reliable character.

The present paper reviews the diagnosis of the genus *Scleroplax*, reveals its morphologic relationships with members of the closely related *Pinnixa* complex and updates its geographic distribution and hosts. Sources of specimens examined in this study include: Laboratorio de Sistemática de Invertebrados, Facultad de Ciencias, Universidad Autónoma de Baja California (UABC); Colección de Referencia de Invertebrados, Instituto de Ciencias del Mar y Limnología (Mazatlán Station), Universidad Nacional Autónoma de México (EMU); National Museum of Natural History, Smithsonian Institution, (USNM); and Natural History Museum of Los Angeles County (material formerly in the holdings of the Allan Hancock Foundation, University of Southern California, Los Angeles, California (AHF)). Other abbreviations used in the account include: cl = carapace length; cw = carapace width; WL = walking legs; MXP3 = third maxilliped; BC = Baja California, México; BCS = Baja California Sur, México.

Systematics

Pinnotheridae de Haan, 1833

Scleroplax Rathbun, 1893

Type species. *Scleroplax granulata* Rathbun, 1893, by original designation and monotypy. Gender feminine.

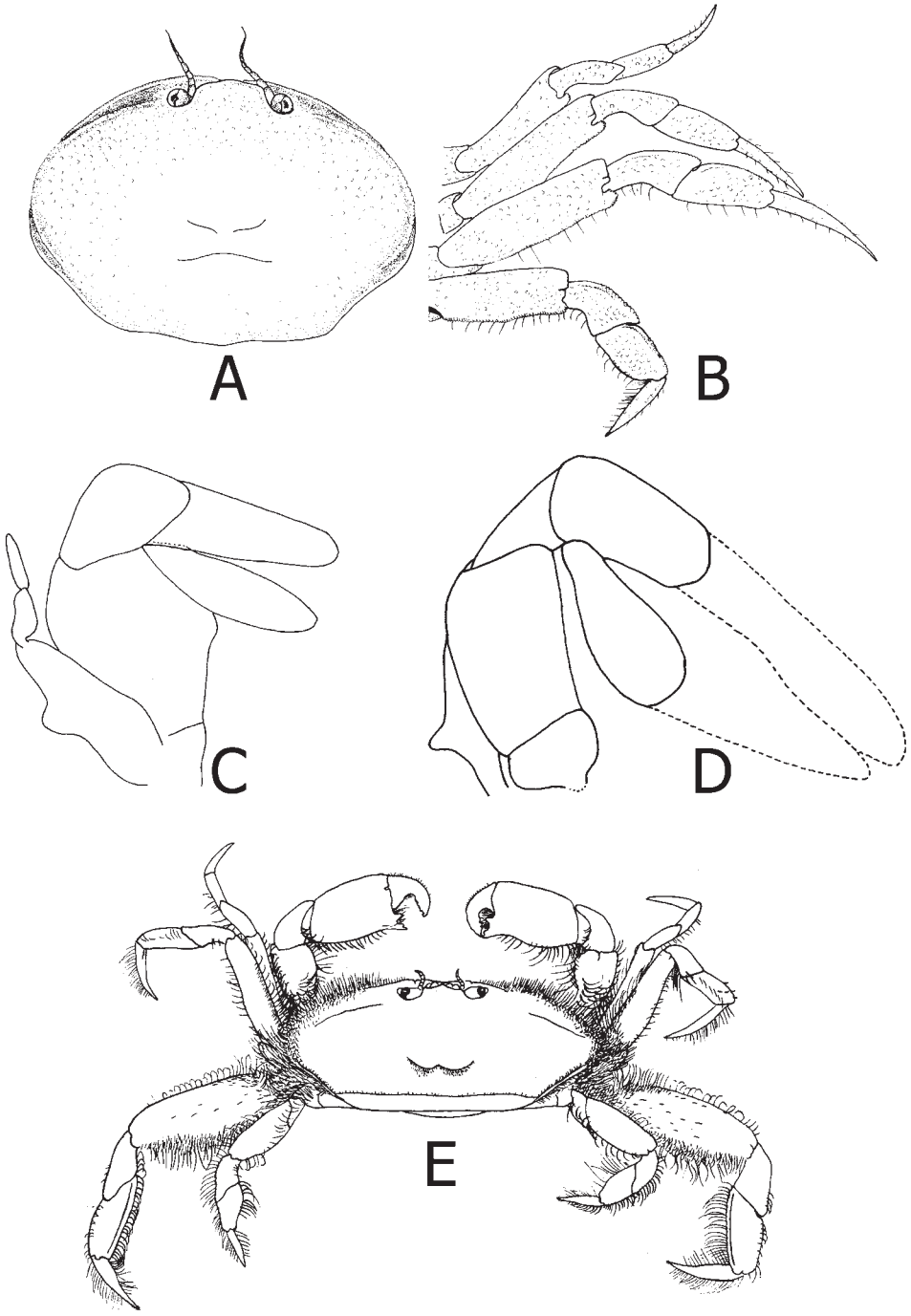

FIGURE 1. A–C *Scleroplax granulata* Rathbun, 1893 (female, cl 4.2 mm, cb 6.0 mm., El Coyote estuary, Abreojos Point, Baja California Sur, México, UABC); D) *Pinnixa* sp. (female, cb = 6.0mm, El Verde estuary, Mazatlán, Sinaloa, México, EMU-842; E) *Auxtinixa cristata* Rathbun, 1900, (male cb 6.3 mm., St. Lucie, Florida, USA, USNM). A, E) dorsal view; B) WL 1–4; C–D) MXP3. Illustrations not to scale. Dotted lines indicate the setae of the propodus and dactylus. (E from Manning and Felder, 1989).

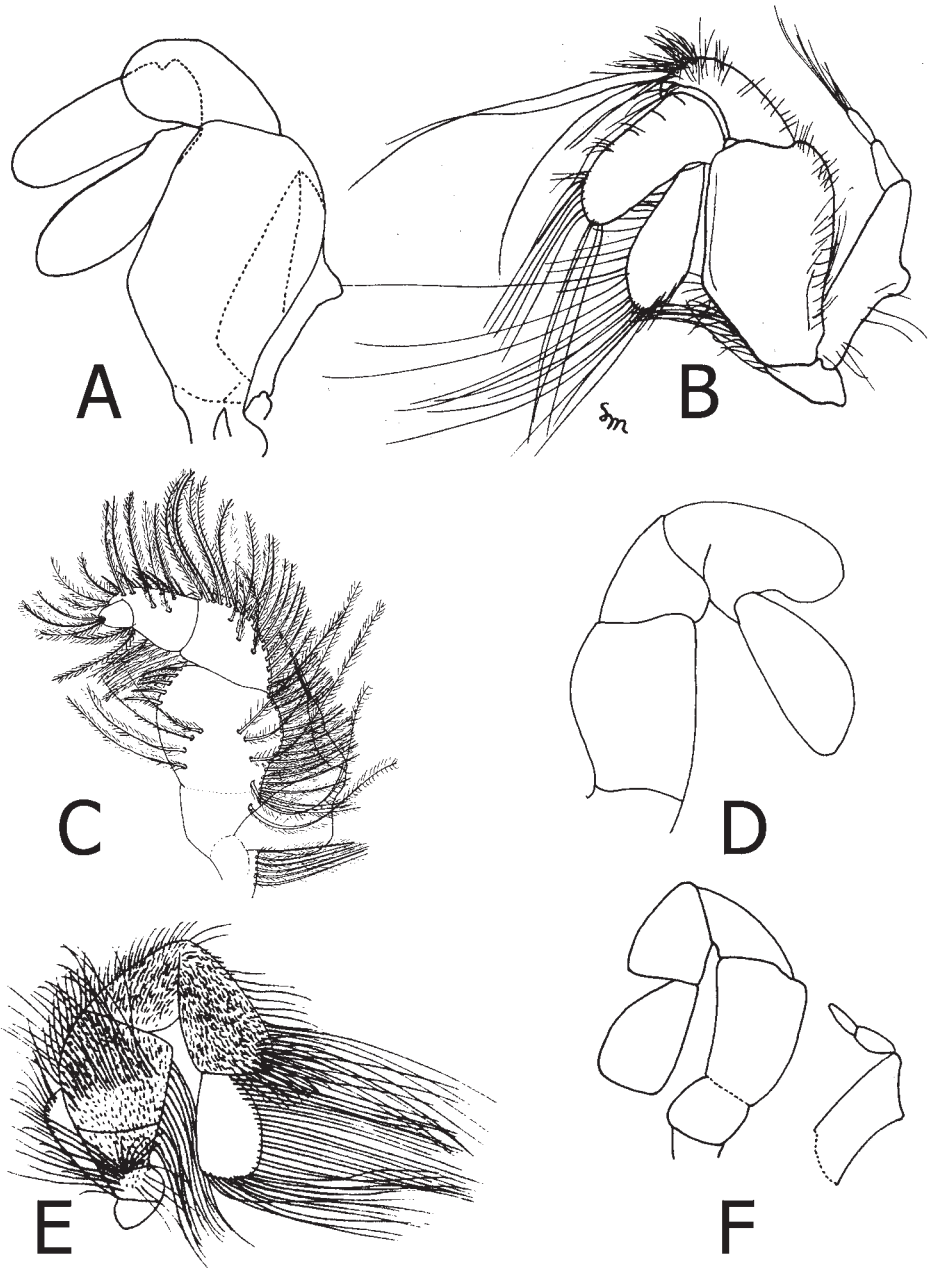

FIGURE 2. A–F, Third maxillipeds. A) *Pinnixa cylindrica* (Say, 1818), (male, cl 5.8 mm, cb 11.8 mm., Sarasota Bay, Florida); B) *Auxtinixa cristata* (Rathbun, 1900), (male, cb 6.5 mm., Pierce Inlet, Florida, USA); C) *Glassella costaricana* (Wicksten, 1982), (female, holotype cl 1.8 mm, cb 4.2 mm., Playa de Coco, Guanacaste, Costa Rica, AHF 806); D) *Indopinnixa sipunculana* Manning and Morton, 1987, (male, holotype cl 2.3 mm, cb 4.2 mm, Tai Tan, Hong Kong, USNM 222500); E) *Tetrias fischeri* (A. Milne-Edwards, 1867), (female, cl 5.4 mm, cb 7.4 mm., Andamas Island); F) *T. scabripes* Rathbun, 1898 (male, cl 6.5 mm, cb 8.1 mm. Southern Gulf of California, México, EMU 4026) (A, from Rathbun, 1918; B, from Manning and Felder, 1989; E from Tesch, 1918).

Hosts. Crustacea, Decapoda (Callianassidae and Upogebidae); Echiurida (Urechidae). In burrows.

Distribution. Pacific Ocean coast, Canada to northern México.

Diagnosis. Carapace hard, subheptagonal, highly convex dorsally, anterolateral margins not forming angle with posterolateral margins; MXP3 slightly oblique, covers buccal cavity, ischio-merus subtrapezoidal, propodus extending to end of dactylus, both spoon-shaped and larger than carpus. WL1-4 of similar shape, third pair slightly longer, fourth not noticeably reduced.

Taxonomic remarks. The revised diagnosis allows the separation of *Scleroplax* from all the known genera in the *Pinnixa* complex. Diagnostic features of *Scleroplax* include the carapace and MXP3. In contrast to *Scleroplax*, in *Pinnixa sensu stricto*, the dactylus always protrudes beyond the distal tip of the shorter propodus. This feature is also observed in the genera *Indopinnixa* Manning & Morton, 1987, and *Austinixa* Heard & Manning, 1997. The shape and insertion point of the articles of MXP3 in *Glassella* Campos & Wicksten, 1997, and *Tetrias* Rathbun, 1898, are so different from *Scleroplax* that misidentification is unlikely (Fig, 2C, E–F). Members of the *Pinnixa* complex can also be separated from *Scleroplax* by their relatively flat carapace that is noticeably wider than long, with WL3 clearly longest and the thin WL4 the shortest.

An analysis of Rathbun (1918), Tesch (1918), Shen (1932), Glassell (1938), Garth, (1960), Righi (1967), Fenucci (1975). Manning & Morton (1987), Manning & Felder (1989), Zmarzly (1992), Campos & Wicksten (1997), Heard & Manning (1997), Campos *et al.* (1998) and Martins & D'Incao (1998) accounts and the study of voucher material listed in Table 1 revealed that the genera *Austinixa*, *Glassella*, *Indopinnixa*, *Pinnixa*, *Scleroplax*, and *Tetrias* should be considered a presumed homogeneous group. All these taxa share at least two inclusive characters, including a distinct carapace that is wider than long and a conspicuous lobe on the outer margin of the basal segment on the exopod of the third maxilliped (Fig 1 C–D, 2 A–F). These novelties distinguish these genera within the Pinnotheridae and may represent a separate monophyletic assemblage. *Alarconia* Glassell, 1938 (see Campos & Wicksten 1997) and the South Pacific genus *Pinnotherelia* Milne Edwards & Lucas, 1843, should not be considered members of this group despite sharing a carapace that is also wider than long. Both genera lack the exopod lobe of MXP3. The systematics of these genera will be discussed elsewhere.

Scleroplax granulata Rathbun, 1893

Type locality. Ensenada, Baja California, México.

Previous known distribution and hosts. Vancouver Island, British Columbia, Canada to Punta Banda estuary, Ensenada, Baja California (Bonfil *et al.* 1992; Campos & Wicksten 1997). In burrows of the echiuroid *Urechis caupo* Fisher & MacGinitie, 1928, and the mud shrimps *Neotrypaea californiensis* (Dana, 1854), *N. gigas* (Dana, 1852) (new

host record), and *Upogebia pugettensis* (Dana, 1852).

TABLE 1. Pinnotherid material examined.

Species	Institution
Austinixa sp.	UABC
Austinixa cristata (Rathbun, 1900)	USNM
Austinixa felipensis (Glassell, 1935)	UABC
Glassella costaricana (Wicksten, 1982)	UABC AHF806
Indopinnixa sipunculana Manning and Morton, 1987	USNM221697, 222500
Pinnixa barnharti Rathbun, 1918	UABC, USNM31510, LACM35-189.1
Pinnixa longipes (Lockington, 1876)	USNM110636
Pinnixa franciscana Rathbun, 1918	USNM110633, 110671
Pinnixa tomentosa Lockington, 1877	
Pinnixa littoralis Holmes, 1894	UABC
Pinnixa schmitti Rathbun, 1918	USNM
P. tubicola Holmes, 1894	USNM20860, UABC
Pinnixa scamit Martin and Zmarzly, 1994	USNM 267500, UABC
Pinnixa richardsoni Glassell, 1936	UABC
Pinnixa valerii Rathbun, 1931	UABC, EMU3769
Pinnixa darwini Garth, 1960	AHF 3812
Pinnixa trasversalis (H. Milne Edwards and Lucas, 1844)	UABC
Pinnixa tumida Stimpson, 1858	UABC
Pinnixa cf. occidentalis Rathbun, 1893	EMU 1416
Pinnixa pembertoni Glassell, 1935	UABC
Pinnixa valdiviensis Rathbun, 1907	UABC (Photographs)
Tetrias scabripes Rathbun, 1898	EMU-
Pinnixa sp.	EMU-842
Scleroplax granulata Rathbun, 1898	UABC, USNM17497
Scleroplax sp.	UABC

Material examined (UABC), new range and host: 10 males, 10 females, Punta Banda estuary, Ensenada, Baja California, 16 May 2006; in burrows of *Neotrypea californiansi*s and *N. gigas* (new host record) and 1 male, 1 female, same locality and date; in burrows of *U. macginiteorum* Williams, 1986 (new host record); 55 males, 54 females (24 ovigerous), 15–17 July 1999 and 6 males, 18 females (8 ovigerous), 16 September 1999, El Coyote estuary, Punta Abreojos, Baja California Sur, México; in burrows of *N. californiansi*s and *N. gigas*.

Remarks. The present records extend the distribution of *S. granulata* about 1000 km southward, from Ensenada, Baja California to El Coyote estuary, Punta Abreojos, Baja California Sur, México and *N. gigas* as a new host. Hendrickx (1984, 1995), with some hesitation, recorded *S. granulata* as occurring in Estero El Verde, Sinaloa, México. The identification of the female specimen (EMU-842) on which Hendrickx based his report shows that it is instead an undescribed species of *Pinnixa*. The tip of the maxilliped dactylus of the new species clearly overreaches the tip of the propodus (Fig. 1D), the flat carapace is transversally subrectangular and the WL3 is much longer than the other legs.

Scleroplax granulata is a common commensal in the middle and low intertidal mud burrows of the echiurid Urechis *caupo* and the mud shimps *N. californiensis*, *N. gigas* and *U. pugettensis* (Garth & Abbott, 1980; present paper). Ricketts *et al.* (1985) recorded *S. granulata* in burrows of *Upogebia* sp., at Punta Banda estuary, Ensenada, Baja California, México. In this locality *S. granulata* has been collected in burrows of the only species of *Upogebia, U. macginiteorum* (see, Campos & Campos, 1989). Other crab species that live in burrows of the same hosts include *Pinnixa franciscana* Rathbun, 1918, and *P. schmitti* Rathbun, 1918 (Zmarzly 1992).

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